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ABSTRACT

The Measurement and Evaluation Center of the University of Texas at Austin conducted a standard-setting study in 1991 to reassess the use of the College Board's Achievement Tests in mathematics, Level I and Level II for course placement and credit by examination in an elementary functions and coordinate geometry course. Students in 20 sections of the course were given either the Level I or the Level II test as part of the final examination. Test scores were obtained for 363 students who took the Level I math test and for 342 students who took the Level II math test. Test results were correlated with preliminary course grades obtained from the instructors. For each of the tests, score values indicated by six guidelines about decision scores in the professional literature were presented to the mathematics department to consider for selecting credit by examination scores and course placement scores. There were five possible decision scores for Level I and four for Level II. The prerequisite requirement for enrollment in the course was not changed, but the scores for receiving credit by examination were changed. Eight tables present study findings. (SLD)

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Standard-Setting Study of College Board Mathematics Level I and Mathematics Level II Achievement Tests for Use in Course Placement and Credit by Examination in Mathematics 305G at The University of Texas at Austin -- Fall 1991

Michael J. Barrett, Shu-Chen Cheng, Steven J. Fitzpatrick,
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Standard-Setting Study of College Board Mathematics Level I and Mathematics Level II Achievement Tests for Use in Course Placement and Credit by Examination in Mathematics 305G at The University of Texas at Austin Fall 1991

Michael J. Barrett, Shu-Chen Cheng, Steven J. Fitzpatrick, H. Paul Kelley, and Barbara G. Dodd

At the request of the Department of Mathematics at The University of Texas at Austin, the Measurement and Evaluation Center (MEC) conducted a standard-setting study during the Fall Semester of 1991 to reassess the use of the College Board's Achievement Tests in Mathematics Level I and in Mathematics Level II for course placement and credit by examination in Mathematics 305G, Elementary Functions and Coordinate Geometry. This is a precalculus course covering elementary functions, their graphs and applications, including polynomial, rational, and algebraic functions, exponential, logarithmic and trigonometric functions. At the time of the study, the prerequisite for the course was a score of 460 or above on the Math Level I test or a grade of at least *B* in a College Algebra course (e.g., M 301). While the Math Level I is the preferred test, students may use a score on the Math Level II test to meet the course prerequisite. Scores of 560 or higher resulted in credit by examination for M 305G.

METHOD

Subjects

Students enrolled in M 305G in the Fall Semester of 1991 were given either the Math Level I or the Math Level II test as part of their end-of-course final examinations. Ten instructors who each taught two sections of M 305G were asked to participate in the studies. The assignment of the Math Level I or Math Level II tests to the 20 sections was done so as to achieve three purposes: (a) Every instructor taught one section that received the Math Level I test and one section that received the Math Level II test, (b) approximately equal numbers of students took each test, and (c) approximately equal numbers of students from morning and afternoon sections took each test.

Students' preliminary course grades in M 305G were obtained from the instructors for comparison with students' scores on the Math Level I or Math Level II tests given as part of the final examination. Preliminary course grades were reported as *A*, *B*, *C*, *D*, or *F* and coded as

4, 3, 2, 1, or 0, respectively, for use in the analyses reported below. Data pairs consisting of preliminary grade and test score were obtained for 363 students who took the Math Level I test and for 342 students who took the Math Level II test.

Placement Tests

The Mathematics Level I Test is an achievement test administered six times yearly by The College Board nationwide. In addition, the MEC administers the test on The University of Texas at Austin campus before each registration period and during each summer orientation session. The Math Level I test consists of 50 multiple-choice items sampling topics included in algebra, plane Euclidean geometry, trigonometry, functional notation, and mathematical reasoning: content deemed to be typical of three years of college-preparatory mathematics studies. Scores are reported in increments of 10, using the College Board's 200-800 scale. The Math Level I test is the instrument used by the Mathematics Department for making placement decisions regarding its courses at the precalculus level.

The Mathematics Level II Test is also a College Board achievement test administered six times yearly nationwide, but it is not offered by the MEC on the University campus. The Math Level II test consists of 50 multiple-choice items sampling topics included in the Math Level I test, especially elementary algebra, coordinate geometry, statistics, and basic trigonometry, but its emphasis is on more advanced, more extensive precalculus content than is the Math Level I test. Scores are reported in increments of 10, using the College Board's 200-800 scale. While the Math Level I test is the department's stated prerequisite for M 305G, students may submit instead a score from the Math Level II test.

Measure of Student Performance in M 305G

So that students would put forth serious effort on the Math Level I or Math Level II test, the tests were given as part of the final examination in the course, and the students were told that this part of the examination would count 5% of their course grade. Each section of M 305G was assigned either the Math Level I or the Math Level II test for inclusion in its final examination, which otherwise consisted of items constructed by the instructor. However, in order to avoid spurious correlations between test scores and preliminary course grades, students' scores on the tests were not used to determine their preliminary course grades. Only the scores on the teacher-constructed portions of the final examinations, along with the grades on coursework throughout the semester, were used in determining students' preliminary course grades.

Procedure

MEC staff calculated summary statistics for each set of test scores and preliminary grades: (a) the mean and standard deviation for each of the two groups of test scores (scores on the Math Level I and on the Math Level II tests); and (b) the mean and standard deviation for each of the two groups of preliminary grades (grades of the students who took the Math Level I test, and of those who took the Math Level II test). Using the two sets of data pairs consisting of preliminary course grade (0-4 scale) and test score (200-800 scale), MEC staff calculated for each set the coefficient of correlation between test scores and preliminary course grades and tabulated for each set a two-way frequency table of test scores by preliminary course grades. MEC staff used a linear regression equation for each set to calculate expected test scores and expected grades for inclusion in the frequency tables. Finally, using six possible guidelines for making cut-score decisions, MEC staff prepared for departmental consideration a table of the cut scores suggested by each of the six guidelines.

RESULTS

MEC staff prepared Tables 1.1-1.4 and 2.1-2.4 to present the results of the standard-setting study to the Mathematics Department. The first set of tables is based upon the set of preliminary grade-test score pairs for students who took the Math Level I test; the second set of tables is based upon the preliminary grade-test score pairs for students who took the Math Level II test.

Mathematics Level I Test

Table 1.1 shows a two-way frequency distribution for test scores (first column, range from 200 to 800) by preliminary course grades (third through seventh columns, range from 0 to 4). The second column contains the expected grade corresponding to each test score, calculated from the Expected Grade regression equation shown to the right of the frequency table. The last column contains the total of the frequencies for each row, thus constituting a one-way frequency distribution of the test scores.

At the bottom of Table 1.1 there are five rows. The Total row contains totals for the six columns with frequency information, thus constituting a one-way frequency distribution of preliminary course grades that contains in the last cell the total number of students who took the Math Level I test. The % row shows the percentages corresponding to the totals in the row just mentioned. The third and fourth rows of the bottom five rows present summary statistics for the students in each grade category and for the total group: The third row shows the test score

Table 1.1
Scores on The College Board Achievement Test in Mathematics Level I in Relation To Student Performance in Mathematics 305G: Frequency Distributions, Descriptive Statistics, Regression Equations, Expected Grades, and Expected Scores
Fall 1991
(N = 363)

		Preliminary Grade in Mathematics 305G					
Test Score	Expected Grade	0 *F*	1 *D*	2 *C*	3 *B*	4 *A*	Total N
690-800	3.87-4.00					1	1
680	3.77			1		3	4
670	3.68			1		4	5
660	3.58					3	3
650	3.49				1	2	3
640	3.39				2	7	9
630	3.29		1	4	6	7	18
620	3.20		1		4	6	11
610	3.10		3	3	4	6	16
600	3.00	2	2	3	3	11	21
590	2.91		1	6	8	5	20
580	2.81	2		2	3	9	16
570	2.71	2	2	7	4	6	21
560	2.62		8	6	10	10	34
550	2.52		4	7	4	5	20
540	2.43	1	2	10	10	3	26
530	2.33		2	2	4	6	14
520	2.23	4	4	6	6	3	23
510	2.14	1	3	5	6	2	17
500	2.04	1	4	1	4	2	12
200-490	0.00-1.94	17	18	14	15	5	69
Total		30	55	78	94	106	363
%		8%	15%	21%	26%	29%	100%
Mean Score		490.33	521.45	543.59	549.68	588.11	550.41
Standard Deviation		62.37	55.67	55.65	52.64	49.93	61.26
Expected Score		494.47	516.62	538.76	560.91	583.05	

Expected Grade = (Test Score x 0.009632) - 2.7754

Expected Score = (Preliminary Grade x 22.1452) + 494.4706

Mean Grade	Standard Deviation
2.53	1.28

Coefficient of Correlation
r = .46

means and the fourth row shows the test score standard deviations within each preliminary grade category. The bottom row contains the expected test score corresponding to each preliminary grade, calculated from the Expected Score regression equation shown to the right of the frequency table. Also shown to the right of the table are the mean and standard deviation of the preliminary course grades for the entire group, and the coefficient of correlation between test scores and preliminary course grades.

The data concerning expected grades and expected scores are included in view of the University's policy for the award of credit by examination, which requires as the criterion for award of credit the same standard of performance for students who take an examination as for students who complete course work. These data may be used to determine from Table 1.1 that the minimally satisfactory grade of *C* (2.00) may be expected for students with a test score of 500, or that for students receiving the minimally satisfactory grade of *C* the expected test score is 539. In order to shorten Table 1.1, grade frequencies for test scores of 200-490 have been summarized in one row; the same has been done for test scores between 690-800.

For convenience in interpreting the data in light of University policy for the award of credit by examination, Table 1.2 collapses the five grade level columns of Table 1.1 into two performance level columns: Unsatisfactory (preliminary grades of *F* or *D*, coded as 0 or 1), and Satisfactory (preliminary grades of *C*, *B*, or *A*, coded as 2, 3, or 4). As in Table 1.1, the bottom rows show column totals, percentages corresponding to those totals, and summary statistics: the test score mean and standard deviation for the group in each column. Unlike Table 1.1, values for expected scores and expected grades are not shown, nor are the regression equations for obtaining those values.

If these 363 persons were new students planning to take M 305G (instead of being students who were completing M 305G), then Table 1.3 indicates the accuracy with which they would be placed by each of 11 possible decision scores ranging from 440 through 590. For each possible decision score in the first column, the second and third columns show the cumulative numbers of students who would be placed correctly, too high, or too low by using that score as a decision criterion. The second column shows the frequency of the two possible placement outcomes for students whose actual preliminary grades in M 305G were unsatisfactory (0 or 1): They would be placed too high if their test scores were at least as high as the score in the left column, or they would be placed correctly if their test scores were below the reference score. The third column shows the frequency of the two possible placement outcomes for students whose preliminary grades in M 305G were satisfactory (2, 3, or 4):

Table 1.2
Scores on The College Board Achievement Test in Mathematics Level I in Relation To Student Performance in Mathematics 305G: Combined Frequency Distributions and Descriptive Statistics
Fall 1991
(N = 363)

	Preliminary Grade in M 305G		
Test Score	Unsatisfactory 0,1	Satisfactory 2-4	Total N
690-800		1	1
680		4	4
670		5	5
660		3	3
650		3	3
640		9	9
630	1	17	18
620	1	10	11
610	3	13	16
600	4	17	21
590	1	19	20
580	2	14	16
570	4	17	21
560	8	26	34
550	4	16	20
540	3	23	26
530	2	12	14
520	8	15	23
510	4	13	17
500	5	7	12
200-490	35	34	69
Total	85	278	363
%	23%	77%	100%
Mean Score	510.47	562.63	550.41
Standard Deviation	60.00	56.24	61.26

Mean Grade	Standard Deviation
2.53	1.28

Coefficient of Correlation
r = .46

Table 1.3
Scores on the College Board Achievement Test in Mathematics Level I in Relation to Student Performance in Mathematics 305G: Possible Decision Scores and Corresponding Accuracies of Placement
Fall 1991
(N = 363)

Place-ment Category	Cumulative Number of Students				Percent of Students in Each Placement Category			Overall Accuracy of Placement		
	Unsatisfactory 0,1 (N = 85)		Satisfactory 2-4 (N = 278)		Unsatisfactory		Satisfactory	Placement Accuracy	Number of Students	% of Students
590 - up	Too High	10	101	Correct	Too High	12%	36% Correct	Too High	10	3%
								Correct	176	48%
Below 590	Correct	75	177	Too Low	Correct	88%	64% Too Low	Too Low	177	49%
580 - up	Too High	12	115	Correct	Too High	14%	41% Correct	Too High	12	3%
								Correct	188	52%
Below 580	Correct	73	163	Too Low	Correct	86%	59% Too Low	Too Low	163	45%
570 - up	Too High	16	132	Correct	Too High	19%	47% Correct	Too High	16	4%
								Correct	201	55%
Below 570	Correct	69	146	Too Low	Correct	81%	53% Too Low	Too Low	146	40%
560- up	Too High	24	158	Correct	Too High	28%	57% Correct	Too High	24	7%
								Correct	219	60%
Below 560	Correct	61	120	Too Low	Correct	72%	43% Too Low	Too Low	120	33%
550 - up	Too High	28	174	Correct	Too High	33%	63% Correct	Too High	28	8%
								Correct	231	64%
Below 550	Correct	57	104	Too Low	Correct	67%	37% Too Low	Too Low	104	29%
540 - up	Too High	31	197	Correct	Too High	36%	71% Correct	Too High	31	9%
								Correct	251	69%
Below 540	Correct	54	81	Too Low	Correct	64%	29% Too Low	Too Low	81	22%
530 - up	Too High	33	209	Correct	Too High	39%	75% Correct	Too High	33	9%
								Correct	261	72%
Below 530	Correct	52	69	Too Low	Correct	61%	25% Too Low	Too Low	69	19%
520 - up	Too High	41	224	Correct	Too High	48%	81% Correct	Too High	41	11%
								Correct	268	74%
Below 520	Correct	44	54	Too Low	Correct	52%	19% Too Low	Too Low	54	15%
510 - up	Too High	45	237	Correct	Too High	53%	85% Correct	Too High	45	12%
								Correct	277	76%
Below 510	Correct	40	41	Too Low	Correct	47%	15% Too Low	Too Low	41	11%
500 - up	Too High	50	244	Correct	Too High	59%	88% Correct	Too High	50	14%
								Correct	279	77%
Below 500	Correct	35	34	Too Low	Correct	41%	12% Too Low	Too Low	34	9%
440 - up	Too High	75	276	Correct	Too High	88%	99% Correct	Too High	75	21%
								Correct	286	79%
Below 440	Correct	10	2	Too Low	Correct	12%	1% Too Low	Too Low	2	1%

They would be placed correctly if their test scores were at least as high as the score in the left column, or they would be placed too low if their test scores were below the reference score. The fourth and fifth columns show the cumulative numbers from the second and third columns converted to percentages. The last two columns show the placement accuracy for the overall group, in number of students and percent of students.

In the professional literature can be found several guidelines suggested for choosing decision scores to be used for course placement and for awarding credit by examination. Table 1.4 lists six possible guidelines for choosing a decision score, with the corresponding Math Level I decision score each guideline would justify. The brief explanation of the rationale for each guideline is followed by a reference to the specific location in one of the preceding tables where the Math Level I decision score can be determined.

Based on this standard-setting study, possible decision scores on the Math Level I test justified by the six guidelines range from a low of 440 to a high of 550.

Mathematics Level II Test

Table 2.1 shows a two-way frequency distribution for test scores (first column, range from 200 to 800) by preliminary course grades (third through seventh columns, range from 0 to 4). The second column contains the expected grade corresponding to each test score, calculated from the Expected Grade regression equation shown to the right of the frequency table. The last column contains the total of the frequencies for each row, thus constituting a one-way frequency distribution of the test scores.

At the bottom of Table 2.1 there are five rows. The Total row contains totals for the six columns with frequency information, thus constituting a one-way frequency distribution of preliminary course grades that contains in the last cell the total number of students who took the Math Level II test. The % row shows the percentages corresponding to the totals in the row just mentioned. The third and fourth rows of the bottom five rows present summary statistics for the students in each grade category and for the total group: The third row shows the test score means and the fourth row shows the test score standard deviations within each preliminary grade category. The bottom row contains the expected test score corresponding to each preliminary grade, calculated from the Expected Score regression equation shown to the right of the frequency table. Also shown to the right of the table are the mean and standard deviation of the preliminary course grades for the entire group, and the coefficient of correlation between test scores and preliminary course grades.

would have been placed correctly, and 3% would have been placed too low. A decision score of 540 would have met three guidelines: (a) It would have identified those students for whom the expected grade was just minimally satisfactory (*C*), but 52% of the students in the Unsatisfactory group would have been placed too high by that score; (b) it would also have been the score for which the overall percents of errors were equal, placing 13% of all students too high and 13% of all students too low; (c) it would also have been the score for which approximately the same number of students would have been cut off (86) as were in the Unsatisfactory group (89). A decision score of 560 is closest to the expected score of students whose performance in the course was just minimally satisfactory, that is, students with preliminary grades of *C*. Finally, a decision score of 570 would have come closest to yielding nearly equal percentages of placement errors for each academic performance category (Unsatisfactory, Satisfactory): 29% of students in the Unsatisfactory group would have been placed too high, and 30% of students in the Satisfactory group would have been placed too low.

MEC staff recommended credit by examination decision scores for each test based on the expected scores of students whose performance in M 305G was just minimally satisfactory, namely, those students with a preliminary grade of *C*. Recommended score ranges for letter grades of *C*, *B*, and *A* were based on the standard error of measurement for each test, which is approximately 30 points. Therefore, the recommended decision score for each test for awarding a grade of *C* was the expected score of students with a preliminary course grade of *C*, and the recommended decision scores for each test for awarding grades of *B* and *A* were, respectively, scores approximately one and two standard errors of measurement above the expected score for a grade of *C*.

The MEC recommendations for awarding credit by examination with a letter grade of *C*, *B*, or *A* were as follows:

Math Level I	Math Level II	Credit for M 305G with a grade of:
600-800	620-800	A
570-590	590-610	B
540-560	560-580	C
200-530	200-550	No Credit

The Department of Mathematics accepted these recommendations, and the new policy for credit by examination in M 305G went into effect during the April 1992 testing period. The prerequisite requirement for enrollment in M 305G was not changed.

In the professional literature can be found several guidelines suggested for choosing decision scores to be used for course placement and for awarding credit by examination. Table 2.4 lists six possible guidelines for choosing a decision score, with the corresponding Math Level II decision score each guideline would justify. The brief explanation of the rationale for each guideline is followed by a reference to the specific location in one of the preceding tables where the Math Level II decision score can be determined.

Based on this standard-setting study, possible decision scores on the Math Level II test justified by the six guidelines range from a low of 480 to a high of 570.

RECOMMENDATIONS AND SELECTION OF DECISION SCORES

For each of the tests the score values indicated by the six guidelines suggested in the professional literature were presented to the Mathematics Department for it to consider in selecting credit-by-examination decision scores. The guidelines are summarized in Tables 1.4 and 2.4 above.

For the Math Level I Test there were five possible decision scores, based on the six guidelines. A decision score of 440 would have maximized the overall placement accuracy for the students in this study: 21% of all the students would have been placed too high, 79% would have been placed correctly, and 1% would have been placed too low. A decision score of 500 would have identified those students for whom the expected grade was just minimally satisfactory (*C*), but 59% of the students in the Unsatisfactory group would have been placed too high by that score. A decision score of 510 would have met two guidelines: (a) It would have been the score for which the overall percents of errors were most nearly equal, placing 12% of all students too high and 11% of all students too low; (b) it would also have been the score for which approximately the same number of students would have been cut off (81) as were in the Unsatisfactory group (85). A decision score of 540 is closest to the expected score of students whose performance in the course was just minimally satisfactory, that is, students with preliminary grades of *C*. Finally, a decision score of 550 would have come closest to yielding nearly equal percentages of placement errors for each academic performance category (Unsatisfactory, Satisfactory): 33% of students in the Unsatisfactory group would have been placed too high, and 37% of students in the Satisfactory group would have been placed too low.

For the Math Level II Test there were four possible decision scores, based on the six guidelines. A decision score of 480 would have maximized the overall placement accuracy for the students in this study: 21% of all the students would have been placed too high, 76%

Table 2.4

Scores on The College Board Achievement Test in Mathematics Level II in Relation to Student Performance in Mathematics 305G: Scores Suggested by Six Guidelines for Use in Selecting Decision Scores
Fall 1991
(N = 342)

Guideline	Mathematics Level II Score
1. Expected Score for students whose performance in course was just minimally satisfactory (i.e., students with preliminary grades of *C*; see Expected Score row at bottom of Table 2.1).	560
2. Score for which Expected Grade was just minimally satisfactory (i.e., *C*; see Expected Grade column in Table 2.1).	540
3. Score for which percents of errors of students in each academic performance category (Unsatisfactory, Satisfactory) were most nearly equal. (See % Too High and % Too Low values in middle columns of Table 2.3.)	570
4. Score for which overall percents of errors were most nearly equal. (See % Too High and % Too Low values in last column of Table 2.3.)	540
5. Score that would have cut off (or held back) approximately the same number of students as were in the Unsatisfactory performance group. (See Table 2.2 for number of students in the Unsatisfactory group and the test score that most nearly identifies that number of low-scoring students.)	540
6. Score that would have maximized overall accuracy of placement. (See number Correct in next-to-last column of Table 2.3.)	480

Table 2.3
Scores on the College Board Achievement Test in Mathematics Level II in Relation to Student Performance in Mathematics 305G: Possible Decision Scores and Corresponding Accuracies of Placement
Fall 1991
(N = 342)

Place-ment Category	Cumulative Number of Students				Percent of Students in Each Placement Category			Overall Accuracy of Placement		
	Unsatisfactory 0,1 (N = 89)		Satisfactory 2-4 (N = 253)		Unsatisfactory		Satisfactory	Placement Accuracy	Number of Students	% of Students
590 - up	Too High	12	132	Correct	Too High	13%	52% Correct	Too High	12	4%
								Correct	209	61%
Below 590	Correct	77	121	Too Low	Correct	87%	48% Too Low	Too Low	121	35%
580 - up	Too High	15	146	Correct	Too High	17%	58% Correct	Too High	15	4%
								Correct	220	64%
Below 580	Correct	74	107	Too Low	Correct	83%	42% Too Low	Too Low	107	31%
570 - up	Too High	26	177	Correct	Too High	29%	70% Correct	Too High	26	8%
								Correct	240	70%
Below 570	Correct	63	76	Too Low	Correct	71%	30% Too Low	Too Low	76	22%
560- up	Too High	30	188	Correct	Too High	34%	74% Correct	Too High	30	9%
								Correct	247	72%
Below 560	Correct	59	65	Too Low	Correct	66%	26% Too Low	Too Low	65	19%
550 - up	Too High	38	204	Correct	Too High	43%	81% Correct	Too High	38	11%
								Correct	255	75%
Below 550	Correct	51	49	Too Low	Correct	57%	19% Too Low	Too Low	49	14%
540 - up	Too High	46	210	Correct	Too High	52%	83% Correct	Too High	46	13%
								Correct	253	74%
Below 540	Correct	43	43	Too Low	Correct	48%	17% Too Low	Too Low	43	13%
530 - up	Too High	52	216	Correct	Too High	58%	85% Correct	Too High	52	15%
								Correct	253	74%
Below 530	Correct	37	37	Too Low	Correct	42%	15% Too Low	Too Low	37	11%
520 - up	Too High	58	222	Correct	Too High	65%	88% Correct	Too High	58	17%
								Correct	253	74%
Below 520	Correct	31	31	Too Low	Correct	35%	12% Too Low	Too Low	31	9%
510 - up	Too High	69	229	Correct	Too High	78%	91% Correct	Too High	69	20%
								Correct	249	73%
Below 510	Correct	20	24	Too Low	Correct	22%	9% Too Low	Too Low	24	7%
490-up	Too High	71	241	Correct	Too High	80%	95% Correct	Too High	71	21%
								Correct	259	76%
Below 490	Correct	18	12	Too Low	Correct	20%	5% Too Low	Too Low	12	4%
480 - up	Too High	72	243	Correct	Too High	81%	96% Correct	Too High	72	21%
								Correct	260	76%
Below 480	Correct	17	10	Too Low	Correct	19%	4% Too Low	Too Low	10	3%

Table 2.2
Scores on The College Board Achievement Test in Mathematics Level II in Relation To Student Performance in Mathematics 305G: Combined Frequency Distributions and Descriptive Statistics
Fall 1991
(N = 342)

	Preliminary Grade in M 305G		
Test Score	Unsatisfactory 0,1	Satisfactory 2-4	Total N
710-800	1	2	3
690-700		8	8
680		3	3
670		5	5
660	2	7	9
650		16	16
640		16	16
630	2	17	19
620		10	10
610	1	16	17
600	2	21	23
590	4	11	15
580	3	14	17
570	11	31	42
560	4	11	15
550	8	16	24
540	8	6	14
530	6	6	12
520	6	6	12
510	11	7	18
200-500	20	24	44
Total	89	253	342
%	26%	74%	100%
Mean Score	529.44	585.97	571.26
Standard Deviation	62.75	62.36	67.21

Mean Grade	Standard Deviation
2.32	1.28

Coefficient of Correlation
r = .44

The data concerning expected grades and expected scores are included in view of the University's policy for the award of credit by examination, which requires as the criterion for award of credit the same standard of performance for students who take an examination as for students who complete course work. These data may be used to determine from Table 2.1 that the minimally satisfactory grade of *C* (2.00) may be expected for students with a test score of 540, or that for students receiving the minimally satisfactory grade of *C* the expected test score is 564. In order to shorten Table 2.1, grade frequencies for test scores of 200-500 have been summarized in one row; the same has been done for test scores between 690-700, and 710-800.

For convenience in interpreting the data in light of University policy for the award of credit by examination, Table 2.2 collapses the five grade level columns of Table 2.1 into two performance level columns: Unsatisfactory (preliminary grades of *F* or *D*, coded as 0 or 1), and Satisfactory (preliminary grades of *C*, *B*, or *A*, coded as 2, 3, or 4). As in Table 2.1, the bottom rows show column totals, percentages corresponding to those totals, and summary statistics: the test score mean and standard deviation for the group in each column. Unlike Table 2.1, values for expected scores and expected grades are not shown, nor are the regression equations for obtaining those values.

If these 342 persons were new students planning to take M 305G (instead of being students who were completing M 305G), then Table 2.3 indicates the accuracy with which they would be placed by each of 11 possible decision scores ranging from 480 through 590. For each possible decision score in the first column, the second and third columns show the cumulative numbers of students who would be placed correctly, too high, or too low by using that score as a decision criterion. The second column shows the frequency of the two possible placement outcomes for students whose actual preliminary grades in M 305G were unsatisfactory (0 or 1): They would be placed too high if their test scores were at least as high as the score in the left column, or they would be placed correctly if their test scores were below the reference score. The third column shows the frequency of the two possible placement outcomes for students whose preliminary grades in M 305G were satisfactory (2, 3, or 4): They would be placed correctly if their test scores were at least as high as the score in the left column, or they would be placed too low if their test scores were below the reference score. The fourth and fifth columns show the cumulative numbers from the second and third columns converted to percentages. The last two columns show the placement accuracy for the overall group, in number of students and percent of students.

Table 1.4

Scores on The College Board Achievement Test in Mathematics Level I in Relation to Student Performance in Mathematics 305G: Scores Suggested by Six Guidelines for Use in Selecting Decision Scores
Fall 1991
(N = 363)

Guideline	Mathematics Level I Score
1. Expected Score for students whose performance in course was just minimally satisfactory (i.e., students with preliminary grades of *C*; see Expected Score row at bottom of Table 1.1).	540
2. Score for which Expected Grade was just minimally satisfactory (i.e., *C*; see Expected Grade column in Table 1.1).	500
3. Score for which percents of errors of students in each academic performance category (Unsatisfactory, Satisfactory) were most nearly equal. (See % Too High and % Too Low values in middle columns of Table 1.3.)	550
4. Score for which overall percents of errors were most nearly equal. (See % Too High and % Too Low values in last column of Table 1.3.)	510
5. Score that would have cut off (or held back) approximately the same number of students as were in the Unsatisfactory performance group. (See Table 1.2 for number of students in the Unsatisfactory group and the test score that most nearly identifies that number of low-scoring students.)	510
6. Score that would have maximized overall accuracy of placement. (See number Correct in next-to-last column of Table 1.3.)	440

Table 2.1
Scores on The College Board Achievement Test in Mathematics Level II in Relation To Student Performance in Mathematics 305G: Frequency Distributions, Descriptive Statistics, Regression Equations, Expected Grades, and Expected Scores
Fall 1991
(N = 342)

		Preliminary Grade in Mathematics 305G					
Test Score	Expected Grade	0 *F*	1 *D*	2 *C*	3 *B*	4 *A*	Total N
710-800	3.48-4.00		1	1		1	3
690-700	3.32-3.40			1	1	6	8
680	3.23			1	1	1	3
670	3.15				4	1	5
660	3.07	1	1		3	4	9
650	2.98			2	7	7	16
640	2.90			3	8	5	16
630	2.81	1	1	5	7	5	19
620	2.73			1	5	4	10
610	2.65	1		6	5	5	17
600	2.56		2	7	5	9	23
590	2.48	2	2	2	5	4	15
580	2.39	1	2	6	8		17
570	2.31	4	7	11	15	5	42
560	2.23	2	2	5	6		15
550	2.14	4	4	7	5	4	24
540	2.06	5	3	2	3	1	14
530	1.98	2	4	2	2	2	12
520	1.89	3	3	2	1	3	12
510	1.81	4	7	5	2		18
200-500	0.00-1.72	13	7	10	13	1	44
Total		43	46	79	106	68	342
%		13%	13%	23%	31%	20%	100%
Mean Score		519.53	538.70	565.95	583.30	613.38	571.26
Standard Deviation		64.23	59.88	64.63	60.04	52.90	67.21
Expected Score		517.62	540.72	563.83	586.93	610.03	

Expected Grade = (Test Score x 0.008384) - 2.4679

Expected Score = (Preliminary Grade x 23.1025) + 517.6218

Mean Grade	Standard Deviation
2.32	1.28

Coefficient of Correlation
r = .44